REMARKS

This paper is being provided in response to the Final Office Action mailed September 9, 2003, for the above-referenced application. In this response, Applicant has amended claims 1, 6, 7, and 8 to clarify that which Applicant considers to be the invention. Applicant respectfully submits that the amendments to the claims are supported by the originally-filed specification.

The rejection of claims 1-8 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,191,416 to Dickson et al. (hereinafter "Dickson") in view of U.S. Patent No. 6,493,041 to Hanko et al. (hereinafter "Hanko") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Applicant's independent claim 1, as amended herein, recites a dot display type video display apparatus displaying an image having a first frame frequency at a second frame frequency that is lower than the first frame frequency. A synchronization signal generation circuit generates a synchronization signal of the second frame frequency. A conversion frequency detector calculates a number of frames making up a unit block at each of the frame frequencies and a number of frames to be thinned based on the first frame frequency and the second frame frequency. A frame memory stores a first frame having the first frame frequency. A difference detector compares intensity data of each dot of a second frame which is currently input to the video display apparatus with intensity data of each dot of the first frame which is stored in the frame memory immediately before the second frame and detects a difference between the two frames. A difference adder counts a number of dots for a case in which the difference of the intensity data detected by the difference detector is greater than a prescribed

value. A movement detection/judgment section distinguishes whether or not a count value detected by the difference adder is below a prescribed value and outputs a signal indicating that thinning of the second frame is possible, when the count value of the difference adders if below the prescribed value. A frame thinning section is included for thinning the second frame in a case in which the signal indicating that frame thinning of the frame is possible is output from the movement detection/judgment section and also a signal indicating the number of frames to be thinned is output from the conversion frequency detector. Further, the second frame is a selected and determinate frame, and the selection of said second frame for thinning by said frame thinning section is based on said signal indicating that thinning of said second frame is possible and said signal indicating said number of frames to be thinned, whereby occurrence of non-continuities in said image when displayed at said second frame frequency is reduced. Claims 2-5 depend directly or indirectly on independent claim 1.

Applicant's independent claim 6, as amended herein, recites a dot display type video display apparatus having substantially the elements as in claim 1, including a frame thinning section as described above and further including a frame thinning stopping section. The frame thinning stopping section stops the frame thinning operation of the frame thinning section within a current block including the first frame and the second frame. The stopping occurs in a case in which, if, as a result of an execution of frame thinning by the frame thinning section, a total number of thinned frames has reached the number of frames to be thinned which is output from the conversion frequency detector. Further, the second frame is a selected and determinate frame, and the selection of said second frame for thinning by said frame thinning section is based on said signal indicating that thinning of said second frame is possible and said signal indicating

said number of frames to be thinned, whereby occurrence of non-continuities in said image when displayed at said second frame frequency is reduced.

Applicant's independent claim 7, as amended herein, recites a plasma display apparatus displaying an image having a first frame frequency and a second frame frequency that is lower than the first frame frequency. The apparatus substantially includes the elements as described above with respect to claims 1 and 6, up to and including a frame thinning stopping section. Further, the frame thinning of said second frame is performed irrespective of a positional order of said second frame in said unit block.

Applicant's independent claim 8, as amended herein, recites a display method for a dot display type video display apparatus having elements as described with respect to claim 1, including a frame thinning section as described above. The method includes the step of comparing the intensity data of the first frame with that of the second frame. The second frame is thinned when the intensity data of the two frames are the same. The frame thinning operation is stopped within a current block including the first frame and the second frame. The stopping operation occurs in a case in which, as a result of an execution of frame thinning, a total number of thinned frames has reached the number of frames to be thinned, which is output from the conversion frequency detector. Further, the second frame is a selected and determinate frame, and the selection of said second frame for thinning by said frame thinning section is based on said signal indicating that thinning of said second frame is possible and said signal indicating said number of frames to be thinned, whereby occurrence of non-continuities in said image when displayed at said second frame frequency is reduced.

The Dickson reference discloses an image processing system for converting a convention low-resolution video signal to a format suitable for transfer to high-resolution film, while preserving the realistic effects of any motion represented in the original video signal. Interpolation and comparison of video fields are utilized to generate background frames by the interlacing of original fields as controlled by difference information determined between interpolated fields. (See Abstract, Figure 4 and col. 7, line 65-col. 8 line 26 of Dickson).

The Hanko reference discloses a method and apparatus for detection motion in video in which frames from an incoming video stream are digitized and compared with a reference frame. In comparing a current frame with the reference frame, a difference count for the current frame generated by a pixel difference counter is compared to the motion detection criteria used by the system to determine whether motion has occurred. A new reference frame is determined upon the occurrence of the first frame for which no motion has been detected after a frame for which motion has been detected. A motion floor value is recalculated based on the amount of motion exhibited in the current frame, the pixel difference counter is zeroed, and processing begins again by digitizing the next frame of a video stream. (See Abstract, Figure 4, and col. 10, lines 18-46 of Hanko).

Applicant provides an example of frame thinning in the prior art in which a fifth frame is mechanically thinned as compared with the frame thinning provided by the present invention. As stated by Applicant (beginning on page 10, line 1 of the present application), in a personal computer, in the case in which an input video signal having a vertical synchronization frequency

of 60 Hz is converted to a video signal having a vertical synchronization signal of 75 Hz, since it is necessary to display five frames of video signal in the time for four frames, the vertical synchronization signal is converted by adding one frame. In the case of Fig. 3(b) shown in the present specification, a frame B', which is the same as frame B, is added.

If the video signal from the personal computer is to be input to a video display apparatus such as a plasma type video display apparatus, and reconverted to 60 Hz, because only four frames are displayed during the time for five frames, one frame is thinned. In the prior art, as shown in Fig. 3(c) of the present specification, four frames from the start were mechanically displayed, *with the fifth frame (frame D) being thinned.* In this case, two frames (B → B') with the same picture can occur consecutively, and the information of frame D is missing, for example, causing non-continuities in a moving image. Thus, in the conventional method, it is not possible to restrict the thinning of frames, meaning that the *actual frame to be thinned is indeterminate, depending on the particular timing,* so-that a moving image becomes non-continuous and the display is not smooth. (See page 10, lines 1-23 of the present application).

In contrast, in the case of the present invention (as shown in Fig. 3(d) of the present application), in accordance with the two different vertical synchronization frequencies, the number of frames in one block required for vertical frequency conversion can be judged to be five frames before conversion and four frames after conversion, respectively, enabling calculation of the number of frames to be thinned. Because it is possible from the information of the movement detection/judgment section to judged that there is little movement information between frame B and frame B', the movement detection/judgment section outputs to the frame

thinning section a signal, which indicates that it is possible to thin the frame B', and the frame thinning section, based on the signal from the movement detection/judgment section and the signal from the conversion frequency detector, which indicates the number of frames to be thinned, executes processing for thinning the frame B'. In this specific example, because the number of frames to be thinned in one block is one frame, by stopping further frame thinning within this block, it is possible to reproduce a moving image continuously, with the sequence A → B → C → D. (See page 10, line 24 to page 11, line 16 of the present application).

Applicant's independent claims 1, 6 and 8, as amended herein, recite that *said second frame is a selected and determinate frame, and wherein selection of said second frame for thinning by said frame thinning section is based on said signal indicating that thinning of said second frame is possible and said signal indicating said number of frames to be thinned, whereby occurrence of non-continuities in said image when displayed at said second frame frequency is reduced.* As described above with respect to Figure 3 of Applicant's specification, Applicant's claimed invention allows a selected and determinate frame to be thinned based on indicating signals that determine whether thinning is possible and the number of frames to be thinned. As recited in the amended independent claim 7, *the frame thinning of said second frame is performed irrespective of a positional order of said second frame in said unit block.*

Applicant respectfully submits that neither Dickson nor Hanko, taken alone or in combination, teach or suggest at least the above features as claimed by Applicant. Specifically, Dickson discloses a procedure for interpolating multiple fields from original fields. The multiple fields are compared with one another and for each pixel in the entire frame, the difference

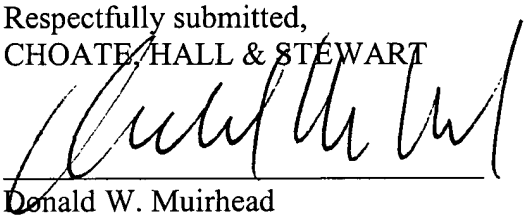
between an original pixel from one field and an interpolated pixel from the other field is generated. Dickson discloses *discarding every fifth field regardless of its content and without any other input to yield two fields for each original film frame.* (See col. 6, lines 6-11 of Dickson). Dickson does not base the discarding of the fifth field on any indicating signals.

Hanko discloses the use of reference frames to compare with frames in which motion has been detected according to motion detection criteria. Upon the occurrence of a new frame having no motion detected after a frame for which motion has been detected, that frame is stored as a new reference frame that is then utilized for subsequent comparisons. (See Hanko, col. 10, lines 31-41). Hanko does not disclose any frame thinning corresponding to a motion detection/judgment signal and a conversion frequency signal to reduce the occurrence of non-continuities in a moving image.

Applicant respectfully submits that neither Dickson nor Hanko, taken alone or in any combination, teach or fairly suggest at least the features that *said second frame is a selected and determinate frame, and wherein selection of said second frame for thinning by said frame thinning section is based on said signal indicating that thinning of said second frame is possible and said signal indicating said number of frames to be thinned, whereby occurrence of non-continuities in said image when displayed at said second frame frequency is reduced*, or that *the frame thinning of said second frame is performed irrespective of a positional order of said second frame in said unit block*, as is claimed by Applicant. Accordingly, Applicant respectfully requests that the rejection of the claims be reconsidered and withdrawn.

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
CHOATE, HALL & STEWART



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